CONESTOGA-ROVERS & ASSOCIATES

651 Colby Drive, Waterloo, Ontario, Canada N2V 1C2
Telephone: (519) 884-0510 Fax: (519) 884-0525
www.CRAworld.com

MEMORANDUM

TO:	Michael Berkoff	REF. NO.:	056393-70
FROM:	Aaron Stadnyk/Rick Hoekstra/cs/8	DATE:	September 10, 2010
CC:	Richard Gay (Weyerhaeuser); Kristi Zakrzewski (MDNRE); Jeff Keiser(CH2MHill); Scott Hutsell(CH2MHill); Grant Koster(CH2MHill); Greg Carli (CRA)		
RE:	**Status Update - Leachate Extraction Well/Leachate Production 12th Street Landfill - Operable Unit No. 4 - Allied Paper/Portage Creek/Kalamazoo River Superfund Site; Plainwell, Michigan**		

A. INTRODUCTION

The following memorandum has been prepared by Conestoga-Rovers & Associates (CRA), on behalf of Weyerhaeuser Company (Weyerhaeuser), to provide a status update on the leachate extraction well and leachate collection activities that have been conducted at the 12th Landfill Site Operable Unit No. 4 of the Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site (Site).

As part of the remedial activities conducted at the Site, CRA installed four temporary leachate extraction wells for the purpose of investigating and removing the potential perched leachate in areas of the landfill that historically received construction debris. The leachate extraction wells were installed in lieu of the specified test pits required in Section 6.3.2 of the Final Design Report for the Site.

The four temporary leachate extraction wells were installed within the identified locations of construction debris, and near the top of the current northwest and southeast side slopes, upgradient of observed leachate seeps emanating from these two side slope areas. Slope excavation activities have been completed around to the west side of the landfill, adjacent to the asphalt plant property, and no further construction debris was observed, nor have any additional seeps been identified.

B. LEACHATE EXTRACTION/COLLECTION ACTIVITIES

The temporary leachate extraction wells (LEW-1 through LEW-4, as shown on Figure 1), were installed to a depth ranging between 15 and 22 feet below ground surface (bgs), with the depths being based on observed subsurface soil conditions. Each leachate well was installed and screened at a depth interval observed to be saturated during the borehole advancement, as shown in the stratigraphic logs included in Attachment A.

Following the installation of the four temporary extraction wells, each well was pumped at various times between August 2, 2010 and August 30, 2010 and is still ongoing. During the pumping activities, both the hydraulic water levels and the daily quantity of leachate removed were recorded. At the commencement of

the pumping activities initial water levels indicated the presence of leachate at three of the four extraction wells (LEW-1, LEW-3, and LEW-4). LEW-2 was determined to be dry, although during the installation of the well, the subsurface soil conditions were noted as being saturated. LEW-2 was inspected daily for the presence of water throughout the pumping activities and continued to remain dry.

Pumping activities commenced at the three active leachate extraction wells. During the ongoing pumping activities, water levels at the locations were regularly measured. Based on the hydraulic water level data, no appreciable influence or hydraulic conductivity between wells was observed.

To date, a total of approximately 1,300 gallons of leachate has been removed (as shown in Table 1), treated on-Site at the temporary water treatment facility and shipped off-Site to the City of Plainwell Water Renewal Plant.

During the first week of pumping activities the recharge rate at each active leachate extraction well was not determined, however the total quantity of leachate removed from each well has been noticeably decreasing. During the pumping activities conducted between August 18, 2010 and August 30, 2010, the approximate rates of recharge at each of the three active extraction wells were determined, as discussed below.

LEW-1:

Between August 2, 2010 and August 16, 2010, leachate was extracted from LEW-1 for a total of six days. Each day during this period, LEW-1 was pumped for approximately four hours, generating an average of approximately 45 gallons each day for a total of approximately 275 gallons for the first six days. The daily rate of leachate generation at LEW-1 gradually increased each day during this period, however, this is assumed to be related to well maintenance that was conducted at LEW-1 and initial development and clearing of the well screen.

Between August 17, 2010 and August 30, 2010, LEW-1 was pumped for a total of four days. During each day, LEW-1 was pumped for approximately 1.5 hours, initially generating approximately 35 gallons per day and gradually decreasing to approximately 10 gallons per day, for a total of 85 gallons collected during the course of the four days. The time required for LEW-1 to recharge after each pumping event increased during this period of time. Initially, this well recharged in approximately 2 hours, but following these four days of pumping, the recharge time at LEW-1 increased to approximately 8.0 hours, as sown in Table 2.

LEW-3:

Between August 2, 2010 and August 16, 2010, leachate was extracted from LEW-3 for a total of six days. Each day during this period, LEW-3 was pumped for approximately four hours, generating an average of approximately 55 gallons each day for a total of approximately 275 gallons for the first six days. The quantity of leachate extracted each day at LEW-3 fluctuated throughout the first three days of pumping, generating between 40 and 80 gallons per day. By the end of the six day pumping period, the average quantity of leachate extracted was approximately 40 gallons per day.

Between August 17, 2010 and August 30, 2010, LEW-3 was pumped for a total of eight days. LEW-3 was pumped for approximately 1.5 hours per day, generating approximately 10 to 15 gallons per day, for a total of approximately 85 gallons during the course of the eight days of pumping. The time required for LEW-3 to recharge after each pumping event increased during this period of time. Initially, the well recharged in approximately 3.0 hours, but following this eight days of pumping, the recharge time at LEW-3 increased to

approximately 6.0hours, as shown in Table 3. It should be noted that the level of leachate at LEW-3 did not recover entirely to the initial elevation prior to pumping.

LEW-4:

Between August 2, 2010 and August 16, 2010, leachate was extracted from LEW-4 for a total of six days. Each day during this period, LEW-4 was pumped for approximately four hours, generating approximately 31 gallons each day for a total of approximately 185 gallons for the first six days. The daily rate of leachate generation at LEW-4 remained relatively constant during this pumping period.

Between August 17, 2010 and August 30, 2010, LEW-4 was pumped for a total of six days. LEW-4 was pumped for approximately 1.5 hours each day, generating approximately 50 gallons per day, for a total of approximately 300 gallons during the course of the six days. The time required for LEW-4 to recharge after each pumping event fluctuated, however increased during this period of time. Initially, the well recharged in approximately 1 hour, but following this six days of pumping, the recharge time at LEW-4 increased to approximately 7.0 hours, with noted fluctuations, as shown in Table 4. It should be noted that the level of leachate at LEW-4 also did not recover entirely to the initial elevation prior to pumping.

C. SITE OBSERVATIONS – LEACHATE SEEP CHARACTERISTICS

During the course of the pumping activities between August 2, 2010 and August 30, 2010, observed seeps in the vicinity of the leachate extraction wells, along the northwest and southeast side slopes, were inspected daily as part of the pumping activities.

Prior to the start of pumping activities, the leachate seep along the northwest side slope of the landfill appeared to have some appreciable generation and noticeable flow. Immediately following rain events, this seep was observed to trickle and flow down the northwest side slope of the landfill. At no time was the leachate emanating from this northwestern seep a concern, as leachate did not migrate off-Site or cause appreciable erosion issues requiring regrading of the slope or the installation of additional soil erosion and sedimentation controls.

The leachate seep along the southeast side slope was observed to have very minimal flow or leachate generation. The leachate emanating from this seep appeared to trickle immediately following rain events. At no time was the southeastern seep a cause for concern, as the leachate emanating from the seep ceased a few feet downgradient and did not migrate off-Site.

In general, during the active pumping activities, leachate seeps have been observed to decrease in overall size and the quantity of leachate emanating from each seep has also visually decreased. The northwest leachate seep has been bisected by LEW-4. The portion of the northwest seep to the north of LEW-4 has virtually dried up and virtually no observable leachate is emanating from this portion. The remaining portion to the south of LEW-4 does have some residual flow. This active portion of the northwest seep was addressed with an interim action discussed in Section D.

Similarly, residual leachate has been observed to be emanating from the southeast leachate seep. The overall length of the seep has decreased; however along the southern end of the seep, leachate is still observed to be seeping and pooling on the southeast side slope of the landfill. It should be noted that virtually no visual flow is observed at the southeast seep, but the presence of leachate is observable.

D. INTERIM RESPONSE ACTIONS – LEACHATE EXTRACTION TRENCHES

To address the residual leachate emanating from the northwest and southeast side slopes, CRA implemented an interim action at each seep location to address leachate. Based on visual observations, small leachate extraction trenches were excavated directly upgradient of the observed leachate seeps. The extraction trenches were excavated along the lateral extent of each seep. Each trench was approximately 2 to 3 feet in depth and 2 feet in width. The base of the trenches were sloped in order to direct leachate to a low point or sump within each trench. The excavated material will be staged directly upslope of the trench, in order to prevent potential storm water from entering the trench.

Leachate was collected from each trench at various times during September 1 through September 3, 2010. A photographic log was prepared to document the interim actions and progress of leachate extraction and is included in Attachment B. On September 3, 2010, the extraction trenches were backfill and compacted in preparation for construction of the landfill cover system.

During the interim measures, approximately 1,800 gallons of leachate was removed from the northeast leachate extraction trench and approximately 2, 200 gallons was removed from the southeast trench. Table 5 presents the daily volumes of leachate extracted from each trench. During the leachate extraction activities, each trench was observed to have some minor leachate recharge. At no time did the recharge flow rate cause leachate to overtop the trenches and migrate off-Site.

Based on the quantity of leachate removed, the consistent location and elevation of the leachate seeps and the continually observed leachate emanating from each extraction trench, leachate appears to be more representative of a groundwater mound within the landfill rather than "perched" groundwater present in isolated locations.

E. SLOPE STABILITY/UPLIFT ASSESSMENT

The stability of the final design of the landfill was based on standard modeling methods using a number of conservative assumptions (included as Appendix B of the Final Design Report). The modeling evaluated both the global stability of the landfill and the factor of safety against a catastrophic slope failure, and the stability of the cover system and the factor of safety against liner system failure. CRA has reviewed the modeling assumptions in comparison to the observed conditions at the landfill and in general, the current condition of the leachate in the landfill is more favorable then the modeled conditions and therefore the presence of leachate in the landfill, whether the leachate is perched or mounded, does not pose a slope stability concern as discussed in the following paragraphs.

Global stability of the landfill was evaluated by assessing the slope stability along several sections of the landfill. As part of this evaluation, the condition where the landfill was assumed to be fully saturated was evaluated and determined to have an acceptable factor of safety against failure. The current leachate levels observed at the Site show that the landfill is in a condition which is substantially less that fully saturated, which would represent a more favorable condition than the assumed fully saturated condition. Therefore, global stability of the landfill is not a concern with respect to the observed leachate levels (i.e., if the global slope stability model was to be re-run using the current leachate levels the factor of safety against failure would be higher than what was presented in the Final Design Report).

The stability of the final cover system was evaluated by assuming an uplift pressure on the landfill liner of two inches (i.e., the level of leachate in the landfill is such that it is causing two inches of upward pressure on the under side of the liner). The minimum factor of safety against failure determined in the cover stability evaluation for this condition was 3.5 (i.e., the upward pressure on the liner would need to be significantly greater than two inches to get to a factor of safety which may have the potential to result in a slope failure condition). The observed quantity of leachate emanating from the visible leachate seeps is minimal in comparison with the final design assumptions for upward pressure, and may cause a slight pressure on the liner if the liner were to be placed directly on the paper residuals. However, the six-inch sand layer, which will be placed between the paper residuals and the liner, will provide relief of any pressure caused by the leachate preventing any uplift pressure to form beneath the liner, and minimize, if not virtually eliminate the accumulation of leachate. In addition, the small amount of observed leachate in the current leachate seeps suggest that the six inch sand layer would still be entirely available for gas venting, as the observed quantity of leachate within the seeps would not block or saturate this sand layer.

F. CONCLUSIONS AND RECOMMENDATIONS

Based on current Site conditions and the information generated from the leachate collection activities, the leachate presence within the landfill does not impact or change the original design and the slope stability evaluation of the landfill, for the following reasons:

1) The leachate present at the landfill appears to be more representative of a groundwater mound within the landfill rather than "perched" groundwater present in isolated locations based on the observed leachate removal and recovery rates and the relatively consistent locations of the seeps that have been observed. If the leachate observed in the leachate extraction wells was perched groundwater, it would be expected that greater dewatering of each area would have occurred which would have been evidenced by a more significant drop in the water level at each location, which did not occur. In addition, after the completion of the leachate extraction trenches, the quantity of leachate extracted and the observed recharge rate of the leachate within each seep confirms that the leachate at the landfill is likely representative of a mounded groundwater condition. Although the overall leachate level within the landfill has not been significantly reduced as a result of the extraction activities, the removal activities that have been completed have reduced the amount and quantity of seeps present.
2) As stated in the Final Design, even if the groundwater mound where much more significant than what has been observed (i.e., fully saturated), the factor of safety against global slope failure is acceptable. Moreover, following the installation of the landfill cover system, the groundwater mound will decrease, further improving the groundwater conditions beneath the Site.
3) The ongoing presence and quantity of leachate emanating from the current seeps at the Site will not impact global or slope stability of the landfill. Following the installation of the landfill cover system, residual leachate emanating from the landfill will be able to percolate along the landfill slopes via the six inch gas venting layer, but will not impact the performance of the sand layer.
4) Based on information generated during the leachate collection activities, "perched" leachate was not encountered at the landfill. In addition, the observed Site conditions pertaining to the presence of leachate will likely provide a higher factor of safety than the factor of safety determined in the final design. Therefore, assumptions included as part of the final design for global stability and cap stability remain valid. It is recommended that the temporary leachate extraction wells be

abandoned in-place and that the construction of the landfill cover system continue, per the final design specifications.

TABLE 1

DAILY QUANTITY OF LEACHATE COLLECTION
12TH STREET LANDFILL SITE
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO SUPERFUND SITE
PLAINWELL, MICHIGAN

Date	Daily Leachate Extraction (US Gallons)			Daily Subtotal
	LEW-1	LEW-3	LEW-4	
8/2/2010	6	-	-	6
8/3/2010	65	45	50	160
8/4/2010	12	15	65	92
8/5/2010	93	87	-	180
8/10/2010	100	86	30	216
8/16/2010	-	40	40	80
8/18/2010	-	-	40	40
8/19/2010	-	10	50	60
8/20/2010	-	10	-	10
8/23/2010	-	15	50	65
8/24/2010	35	-	-	35
8/25/2010	30	25	40	95
8/26/2010	10	10	80	100
8/30/2010	10	15	50	75
8/31/2010	15	15	50	80
Subtotal	**376**	**373**	**545**	
			Total Leachate Collected:	**1294**

Notes:

"-" - No value available.

TABLE 2

LEW-1 HYDRAULIC MONITORNG DATA
12TH STREET LANDFILL SITE
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE
PLAINWELL, MICHIGAN

Date	Time	Water Level (ft bgs)	Pump Status	Recharge Time (hh:mm)
8/24/2010	10:51	14.96	Off	
	11:02	24.53	On	
	11:15	24.59	On	
	13:31	21.21	On	
	13:36	24.55	On	
	16:15	24.59	On	
	16:21	24.02	Off	
	18:27	19.98	Off	2:12
8/25/2010	9:09	15.03	Off	
	11:35	15.02	Off	
	12:51	15.02	Off	
	13:34	24.50	On	
	14:42	24.58	On	
	14:51	23.50	On	
	15:11	22.83	Off	
	16:24	20.41	Off	
	16:45	19.82	Off	
	17:39	18.41	Off	
	18:37	17.04	Off	3:55
8/26/2010	8:25	15.05	Off	
	9:30	24.05	On	
	12:14	17.68	Off	
	13:34	16.18	Off	
	20:17	15.15	Off	8:03
8/30/2010	9:02	15.13	Off	
	9:21	24.58	On	
	10:43	24.57	On	
	10:48	24.19	Off	
	11:04	23.25	Off	
	12:51	20.31	Off	
	13:59	18.74	Off	
	15:38	16.72	Off	
	16:43	15.95	Off	
	17:20	15.85	Off	7:59

TABLE 3

LEW-3 HYDRAULIC MONITORNG DATA
12TH STREET LANDFILL SITE
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE
PLAINWELL, MICHIGAN

Date	Time	Water Level (ft bgs)	Pump Status	Recharge Time (hh:mm)
8/19/2010	9:03	11.11	Off	
	9:42	11.05	Off	
	12:02	11.06	Off	
	13:40	11.09	Off	
	15:36	11.06	Off	
	15:56	19.80	On	
	16:09	19.81	On	
	19:50	11:57	Off	3:41
8/23/2010	8:08	11.15	On	
	9:53	11.18	Off	
	11:08	11.18	Off	
	13:26	11.13	Off	
	13:42	19.75	On	
	13:51	19.83	On	
	15:03	19.85	On	
	16:53	18.69	Off	
	17:08	18.12	Off	
	18:03	16.59	Off	
	18:49	15.45	Off	3:46
8/25/2010	9:15	11.16	Off	
	11:38	11.19	Off	
	11:44	18.01	On	
	12:45	19.96	On	
	13:07	18:59	Off	
	13:40	16.93	Off	
	14:31	15.50	Off	
	14:54	14.55	Off	
	15:14	14.08	Off	
	16:17	12.73	Off	
	16:47	12.11	Off	
	17:37	11:48	Off	
	18:35	11.41	Off	5:28

TABLE 3

LEW-3 HYDRAULIC MONITORNG DATA
12TH STREET LANDFILL SITE
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE
PLAINWELL, MICHIGAN

Date	Time	Water Level (ft bgs)	Pump Status	Recharge Time (hh:mm)
8/26/2010	8:20	11.25	Off	
	9:35	11.30	Off	
	10:35	20.00	On	
	12:07	15.16	Off	
	13:30	13.53	Off	
	16:15	11.38	Off	5:40
8/30/2010	9:00	11.23	Off	
	10:57	11.24	Off	
	11:01	19.38	On	
	12:48	19.96	On	
	12:53	18.73	Off	
	13:57	16.86	Off	
	15:29	15.12	Off	
	16:40	13.99	Off	
	17:18	13:45	Off	4:30
8/31/2010	8:23	11.26	Off	
	10:45	11.24	Off	
	10:50	19.80	On	
	11:24	19.95	On	
	11:51	19.84	Off	
	12:00	18.45	Off	
	13:24	15.83	Off	
	16:14	13.13	Off	
	17:31	12.19	Off	5:40

TABLE 4

LEW-4 HYDRAULIC MONITORNG DATA
12TH STREET LANDFILL SITE
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE
PLAINWELL, MICHIGAN

Date	Time	Water Level (ft bgs)	Pump Status	Recharge Time (hh:mm)
8/18/2010	13:31	8.09	On	
	15:48	19.35	On	
	15:56	17.20	Off	
	16:00	15.20	Off	
	16:13	12:48	Off	
	17:00	8.82	Off	1:12
8/19/2010	9:12	8.07	On	
	9:30	18.10	On	
	10:07	17.50	On	
	11:51	19.98	On	
	12:05	15.29	Off	
	13:49	8.59	Off	
	15:43	8.21	Off	
	16:06	8.19	Off	6:36
8/23/2010	8:10	7.94	On	
	9:38	18.00	On	
	9:48	19.80	On	
	11:13	19.97	On	
	11:52	19.98	On	
	12:08	15.60	Off	
	13:34	8.50	Off	
	13:53	8.36	Off	
	15:09	8.14	Off	
	16:59	8.03	Off	5:07
8/25/2010	9:05	8.02	On	
	9:22	19.80	On	
	10:13	20.02	On	
	10:19	17.60	Off	
	11:16	8.86	Off	
	11:31	8.65	Off	
	12:48	8.24	Off	
	13:37	8.18	Off	
	14:37	8.15	Off	
	15:02	8.11	Off	4:49

TABLE 4

LEW-4 HYDRAULIC MONITORNG DATA
12TH STREET LANDFILL SITE
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE
PLAINWELL, MICHIGAN

Date	Time	Water Level (ft bgs)	Pump Status	Recharge Time (hh:mm)
8/30/2010	9:06	8.31	Off	
	10:54	8.28	Off	
	14:05	8.21	Off	
	14:09	20.05	On	
	15:33	20.05	Off	
	15:45	19.10	Off	
	16:46	9.09	Off	
	17:23	8.65	Off	3:14
8/31/2010	8:30	8.20	Off	
	8:36	20.02	On	
	9:51	20.04	Off	
	10:00	17.10	Off	
	10:11	13.72	Off	
	10:53	9.27	Off	
	11:18	8.85	Off	
	11:55	8.56	Off	
	13:26	8.34	Off	
	15:44	8.24	Off	
	17:28	8.19	Off	7:37

TABLE 5

INTERIM ACTION - LEACHATE EXTRACTION SUMMARY
12TH STREET LANDFILL - OPERABLE UNIT NO. 4
ALLIED PAPER INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE
PLAINWELL, MICHIGAN

Date	Quantity of Daily Leachate Extracted (gallons)	
	Northeast Trench	Southeast Trench
1-Sep-10	285	655
2-Sep-10	410	580
3-Sep-10	1,100	1,000
Subtotal	**1,795**	**2,235**

ATTACHMENT A

FIELD BORING LOGS

STRATIGRAPHY LOG (OVERBURDEN)

PROJECT NAME 12th Street Landfill
PROJECT NUMBER 056393
CLIENT Weyerhaeuser
LOCATION Otsego, MI

DRILLING CONTRACTOR EDAC
DRILLER Shawn
SURFACE ELEVATION
WEATHER (A.M.)
(P.M.)

HOLE DESIGNATION extraction well # 1
DATE/TIME STARTED 7/26/10
DATE/TIME COMPLETED
DRILLING METHOD Auger - 6 1/4" BH
CRA SUPERVISOR C. Bondy

	STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION (ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) – PRIMARY COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS. NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).)	SAMPLE DETAILS: SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	N	R	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
Attempt #1	0		2.5	SP-SAND (FILL), with gravel, f. sand, f to c. gravel, pg, loose, brown, moist.													
	2.5		10.0	Flyash													
		8.0		with paper residuals, sat.													
	10.0		15.0	Paper residuals, bluish-gray, sat.													
				E.O.B. 15' bgs													
Attempt #2	0		5.0	SP-SAND (FILL), with gravel, tr. cobbles, f. sand, f to c. gravel, pg, loose, brown, moist.													
		1.5		gravelly sand, with cobbles, tr. rebar debris													
	5.0		8.0	Flyash													
	8.0		16.0	Paper residuals, bluish-gray, moist													
		12.5		v. moist.													
				E.O.B. 15' bgs													

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING _____ DEPTH OF FIRST GROUNDWATER ENCOUNTER _____ TOPSOIL THICKNESS _____
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION _____ AFTER ____ HOURS ____
COMPLETION DETAILS:

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.
NOTES:

Note: Soil cuttings from augers used to describe lithology.

STRATIGRAPHY LOG (OVERBURDEN)

PROJECT NAME 17th Street Landfill
PROJECT NUMBER 056393
CLIENT Weyerhaeuser
LOCATION Otsego, MI

DRILLING CONTRACTOR EDAC
DRILLER Shawn
SURFACE ELEVATION
WEATHER (A.M.)
(P.M.)

HOLE DESIGNATION extraction well #1
DATE/TIME STARTED 7/26/10
DATE/TIME COMPLETED
DRILLING METHOD Auger - 6 1/4" ID
CRA SUPERVISOR C. Bandy

	STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION (ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) – PRIMARY COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS. NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).)	SAMPLE DETAILS: SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	N	R	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
Attempt #3	0		0.5	Flyash													
	0.5		3.5	SP-SAND (FILL), with gravel, f. sand, f-to c. gravel, pg, l, b, m													
	3.5		7.0	CL-CLAY (FILL), with paper residuals, pg, low plast, soft, gray, moist to v. moist.													
	7.0		10.0	Wood debris													
	10.0		11.0	CL-CLAY (FILL), as 3.5-7.0'													
	11.0		15.0	Paper residuals, bluish-gray, moist													
				E.O.B. 15' bgs													
Attempt #4	0		2.5	SP-SAND (FILL), with gravel, tr. wood debris + cobbles, pg, loose, brown, moist.													
		0.5		no wood debris or cobbles													
		1.5		with flyash													
		2.0		no flyash													
	2.5		10.0	Flyash													
		8.5		v. moist													
		9.0		Sat.													

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING _____ DEPTH OF FIRST GROUNDWATER ENCOUNTER _____ TOPSOIL THICKNESS _____
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION _____ AFTER ____ HOURS ____
COMPLETION DETAILS: _____

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.
NOTES:

10.0 15.0 CL-CLAY (FILL), with paper residuals, pg, low plast, soft, gray, moist

E.O.B. 15' bgs

Note: Soil cuttings from augers used to describe lithology.

STRATIGRAPHY LOG (OVERBURDEN)

PROJECT NAME 17th Street Landfill
PROJECT NUMBER 056393
CLIENT Weyerhaeuser
LOCATION Otsego, MN

DRILLING CONTRACTOR ESAC
DRILLER Shaun
SURFACE ELEVATION
WEATHER (A.M.)
(P.M.)

HOLE DESIGNATION extraction well #1
DATE/TIME STARTED 7/27/10
DATE/TIME COMPLETED
DRILLING METHOD Auger - 6¼" BH
CRA SUPERVISOR C. Bondy

STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) – PRIMARY COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).	SAMPLE DETAILS: SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	N	R	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
Attempt #5																
0		5.5	CL-CLAY (FILL), with paper residual, sand + gravel, f. sand, f to c. gravel, pg, low plast, firm, brown, moist													
5.5		7.0	GP-GRAVEL (FILL), with sand, f to c gravel, f. sand, pg, loose, brown, moist													
7.0		10.0	CL-CLAY (FILL), with paper residuals, pg, low plast, soft, moist to v. moist.													
10.0		15.0	Paper residuals, bluish-gray, moist. E.O.B. 15' bgs.													
Attempt #6																
0		2.5	Flyash													
	2.0		v. moist													
2.5		4.5	CL-CLAY (FILL), with paper residuals, pg, low plast, firm, gray, moist													
4.5		10.0	Flyash													
10.0		11.5	SP-SAND (FILL), with gravel, f. sand, f to c. gravel, pg, loose, brown v. moist													
11.5		14.0	CL-CLAY (FILL) as 2.5-4.5'.													
14.0		15.0	Paper residuals E.O.B. 15' bgs													

DEPTH OF BOREHOLE CAVING _____ DEPTH OF FIRST GROUNDWATER ENCOUNTER _____ TOPSOIL THICKNESS _____
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION _____ AFTER ____ HOURS ____
COMPLETION DETAILS:

NOTES AND COMMENTS

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.
NOTES:

Note: Soil cuttings from augers used to describe lithology.

STRATIGRAPHY LOG (OVERBURDEN)

PROJECT NAME 12th Street Landfill
PROJECT NUMBER 056393
CLIENT Weyerhaeuser
LOCATION Otsego, MN

DRILLING CONTRACTOR EDAC
DRILLER Shawn
SURFACE ELEVATION
WEATHER (A.M.)
(P.M.)

HOLE DESIGNATION extraction well #1
DATE/TIME STARTED 7/27/10
DATE/TIME COMPLETED
DRILLING METHOD Auger - 6¼" BH
CRA SUPERVISOR C. Bondy

STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) – PRIMARY COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).
			Attempt #7
0		3.5	Flyash
3.5		4.0	CL-SANDY CLAY (FILL), with paper residuals, pg, low plast, firm, gray, sat.
4.0		9.0	SP-SAND (FILL), with clay + paper residuals, pg, loose, brown, v. moist
9.0		11.0	SP-SAND (FILL), with gravel, f. sand, f to c. gravel, pg, loose, brown, moist
	11.0		Refusal (feels like concrete)
			E.O.B. 11' bgs
			Attempt #8
0		10.0	Flyash
	5.0		1' of concrete debris
10.0		21.0	CL-SANDY CLAY (FILL), f. grained, pg, low plast, firm, gray, v. moist
	12.0		clay with sand, sat.
21.0		22.5	Paper residuals, bluish-gray, sat.
			E.O.B. 22.5' bgs
			Well Details: 4" PVC, stick-up
			screen 11-21', sand 9-22.5', chip 0-9'

SAMPLE DETAILS												CHEMICAL ANALYSIS	GRAIN SIZE
SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	N	R	SAMPLE INTERVAL	PID / FID (ppm)				

Note: When augers were pulled out there was wire wrapped around the last 5' of auger.

DEPTH OF BOREHOLE CAVING _____ DEPTH OF FIRST GROUNDWATER ENCOUNTER _____ TOPSOIL THICKNESS _____
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION _____ AFTER _____ HOURS _____
COMPLETION DETAILS: _____

NOTES AND COMMENTS

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.
NOTES:

Note: Soil cuttings from augers used to describe lithologies.

STRATIGRAPHY LOG (OVERBURDEN)

PAGE 1 OF 1

PROJECT NAME 12th Street Landfill
PROJECT NUMBER 056393
CLIENT Weyerhaeuser
LOCATION Otsego, MI

DRILLING CONTRACTOR EDAC
DRILLER Shawn
SURFACE ELEVATION
WEATHER (A.M.)
(P.M.)

HOLE DESIGNATION extraction well #2
DATE/TIME STARTED 7/26/10
DATE/TIME COMPLETED
DRILLING METHOD Auger - 6 1/4" BH
CRA SUPERVISOR C. Bondy

STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION	SAMPLE DETAILS: SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	N	R	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
0		3.0	SP-SAND (FILL), with gravel, f. grained, pg, loose, brown, moist.												
3.0		12.0	Flyash												
	8.75		Saturated												
	10.0		With paper residuals												
12.0		15.0	Paper residuals, bluish-gray in colour, v. moist												
			E.O.B. 15' bgs												
			Well Details:												
			• 4" PVC, stick up												
			• screen 7-17', sand 5-17', chip 0-5'												
			Note: Soil cuttings from augers used to describe lithology.												

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING _____ DEPTH OF FIRST GROUNDWATER ENCOUNTER _____ TOPSOIL THICKNESS _____
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION _____ AFTER ____ HOURS ____
COMPLETION DETAILS: _____

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.
NOTES:

STRATIGRAPHY LOG (OVERBURDEN)

PAGE 1 OF 1

PROJECT NAME 12th Street Landfill
PROJECT NUMBER 056393
CLIENT Weyerhaeuser
LOCATION Allegan & Otsego, MI

DRILLING CONTRACTOR EDAC
DRILLER Shawn
SURFACE ELEVATION
WEATHER (A.M.)
(P.M.)

HOLE DESIGNATION extraction well #3
DATE/TIME STARTED 7/26/10
DATE/TIME COMPLETED
DRILLING METHOD Auger-6 1/4" BH
CRA SUPERVISOR C. Bondy

STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) – PRIMARY COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).
0		3.0	SP-SAND(FILL), with gravel, tr cobbles + construction debris, f. sand, f-to c. gravel, pg, loose, brown, moist
	2.0		no cobbles
3.0		12.0	Flyash
	5.0		very moist
	7.0		Saturated
12.0		15.0	Paper residuals, bluish-gray, sat.
			E.O.B. 15' bgs
			Well Details:
			• 4" PVC, stick up
			• screen 6-16', sand 4-16', chip 0-4'
			Note: Soil cuttings from augers used to describe lithology.

SAMPLE DETAILS											CHEMICAL ANALYSIS	GRAIN SIZE
SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	N	R	SAMPLE INTERVAL	PID / FID (ppm)			

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING _____ DEPTH OF FIRST GROUNDWATER ENCOUNTER _____ TOPSOIL THICKNESS _____
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION _____, AFTER _____ HOURS _____
COMPLETION DETAILS: _____

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.
NOTES:

STRATIGRAPHY LOG (OVERBURDEN)

PAGE 1 OF 1

PROJECT NAME 12th Street Landfill
PROJECT NUMBER 056393
CLIENT Weyerhaeuser
LOCATION Otsego, MI

DRILLING CONTRACTOR EDAC
DRILLER Shawn
SURFACE ELEVATION
WEATHER (A.M.)
(P.M.)

HOLE DESIGNATION extraction well #4
DATE/TIME STARTED 7/27/10
DATE/TIME COMPLETED CB.
DRILLING METHOD Auger - 6 1/4" BH
CRA SUPERVISOR C. Bondy.

STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) – PRIMARY COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).
0		2.0	Flyash with paper residuals, tr. cobbles
	0.5		tr. paper residuals
2.0		12.0	SP - SAND (FILL), with gravel, f. sand, f to c. gravel, pg, loose, brown, moist.
	7.0		v. moist
	8.0		saturated
12.0		16.0	Paper residuals, bluish-gray, sat.
			E.O.B. 16' bgs
			Well Details: - 4" PVC, stick-up - screen 6-16', sand 4-16', chip 0-4'.
			Note: Soil cuttings from augers used to describe lithology.

SAMPLE DETAILS

SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	N	R	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING _____ DEPTH OF FIRST GROUNDWATER ENCOUNTER _____ TOPSOIL THICKNESS _____
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION _____, AFTER ____ HOURS ____
COMPLETION DETAILS: _____

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.
NOTES:

ATTACHMENT B

PHOTOGRAPHIC LOG OF LEACHATE EXTRACTION TRENCHES

Photo 1: View of northwest trench location, looking north

Photo 2: View of south end of leachate trench

Photo 3: Close-up of east sidewall at southern end of leachate trench

Photo 4: Trickling of leachate from east sidewall

Photo 5: View of leachate trench, looking north

Photo 6: View of west sidewall of trench

Photo 7: View of northern end of trench

Photo 8: View of trench approximately 45 minutes after excavating

Photo 9: View of southern end of trench approximately 2 hours after excavating

Photo 10: View of northern portion of trench approximately 2 hours after pumping, looking south

Photo 11: Pumping leachate out of southern end of trench ~ time of 13:20

Photo 12: View of northern end of trench after pumping ~ time of 14:20

Photo 13: Another view of northern end of trench after pumping, looking north

Photo 14: View of north end of trench approximately 1 hour after pumping (15:38)

Photo 15: View of southern end of trench approximately 2 hours after pumping (15:38)

Photo 16: Close-up view of west sidewall on southern end of trench

Photo 17: View of northern and southern portions of trench approx 1 to 2 hours, respectively, after pumping, looking north

Photo 18: View of southern end of trench after pumping (15:57)

Photo 19: Close-up of south end area after pumping

Photo 20: View of north end after pumping (16:00)

Photo 21: View of pin flags in trench marking low point of leachate after pumping

Photo 22: Close-up of location of pin flags marking the low point of leachate after pumping

Photo 23: Close-up of location of pin flag on the southern end of trench, marking the low point of leachate after pumping

Photo 24: View of trench the morning of 9/2/10, looking south

Photo 25: View of southern end of trench the morning of 9/2/10

Photo 26: View of trench the morning of 9/2/10, looking north

Photo 27: View of trench at southern end after removing 210 gallons

Photo 28: View of trench at northern end after removing 420 gallons

Photo 29: View of trench at southern end after removing 420 gallons

Photo 30: View of trench the morning of 9/3/10, looking north

Photo 31: View of southern end area of trench the morning of 9/3/10

Photo 32: View of northern end of trench the morning of 9/3/10, looking north

Photo 1: View of east trench location, looking south

Photo 2: View of slurry-like sand material in trench excavation

Photo 3: View trench looking north

Photo 4: View of east sidewall of trench, looking north

Photo 5: View of leachate trench approx 2 hours after excavating, looking north

Photo 6: Pumping leachate from trench, looking south

Photo 7: View of trench after pumping, looking northwest

Photo 8: View of trench approx 1.5 hours after pumping

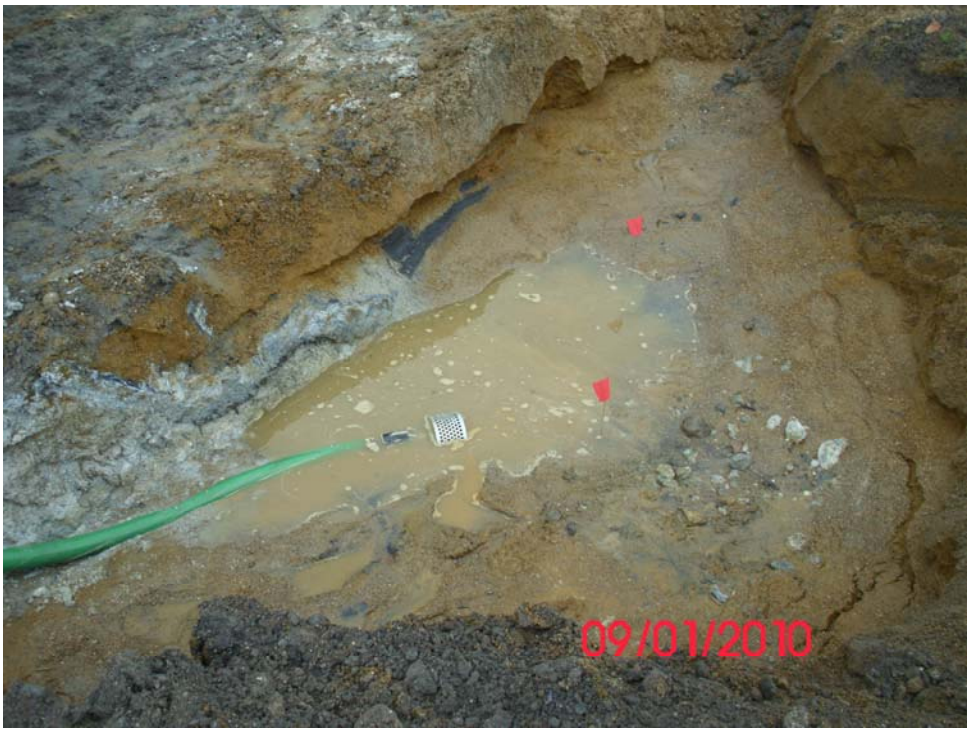

Photo 9: View leachate pumping and pin flags set to mark low point of leachate

Photo 10: View of trench the morning of 9/2/10, looking south

Photo 11: Pumping of leachate from trench, looking north

Photo 12: View of trench after pumping

Photo 13: View of trench approx 2.5 hours after pumping

Photo 14: View of trench the morning of 9/3/10, looking southwest